Centre Number						Candidate Number				
Surname										
Other Names										
Candidate Signature										

For Examiner's Use	
Examiner's Initials	
Question	Mark
1	
2	
3	
4	
5	
6	
7	
8	
9	
TOTAL	

AQA

General Certificate of Secondary Education
Foundation Tier
June 2014

Science A
Unit Physics P1

PH1FP

F

Physics
Unit Physics P1

Thursday 12 June 2014 9.00 am to 10.00 am

For this paper you must have:
- a ruler
- a calculator
- the Physics Equations Sheet (enclosed).

A

Time allowed
- 1 hour

Instructions
- Use black ink or black ball-point pen.
- Fill in the boxes at the top of this page.
- Answer **all** questions.
- You must answer the questions in the spaces provided. Do not write outside the box around each page or on blank pages.
- Do all rough work in this book. Cross through any work you do not want to be marked.

Information
- The marks for questions are shown in brackets.
- The maximum mark for this paper is 60.
- You are expected to use a calculator where appropriate.
- You are reminded of the need for good English and clear presentation in your answers.
- Question 9 should be answered in continuous prose.
  In this question you will be marked on your ability to:
  – use good English
  – organise information clearly
  – use specialist vocabulary where appropriate.

Advice
- In all calculations, show clearly how you work out your answer.

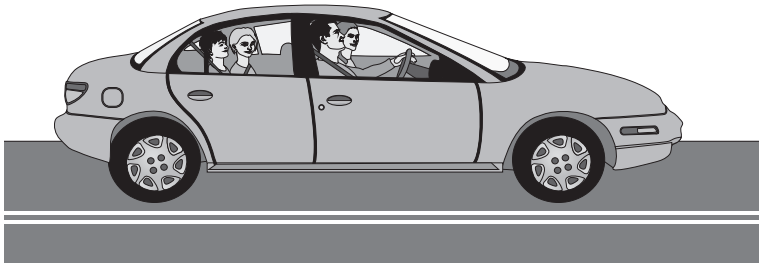
Do not write outside the box

Answer **all** questions in the spaces provided.

1 **Figure 1** shows a car with an electric motor.

The car is moving along a flat road.

Figure 1



1 (a) (i) Use the correct answers from the box to complete each sentence.

[3 marks]

light	**electrical**	**kinetic**	**potential**	**sound**

The car's motor transfers ..... energy

into useful ..... energy as the car moves.

Some energy is wasted as ..... energy.

1 (a) (ii) What happens to the wasted energy?

[1 mark]

.....

.....

Do not write outside the box

1 (b) The electric motor has an input energy of 50 000 joules each second.

The motor transfers 35 000 joules of useful energy each second.

Calculate the efficiency of the electric motor.

Use the correct equation from the Physics Equations Sheet.

[2 marks]

.....

.....

.....

Efficiency = ...

6

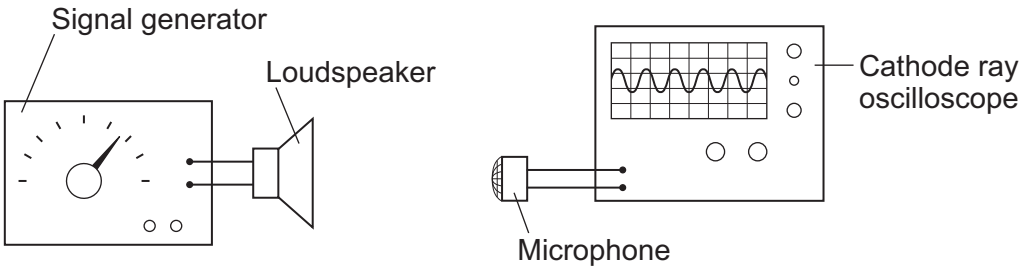
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2 (a) **Figure 2** shows a signal generator connected to a loudspeaker.

The signal generator is adjusted to change the sound wave produced by the loudspeaker.

Figure 2

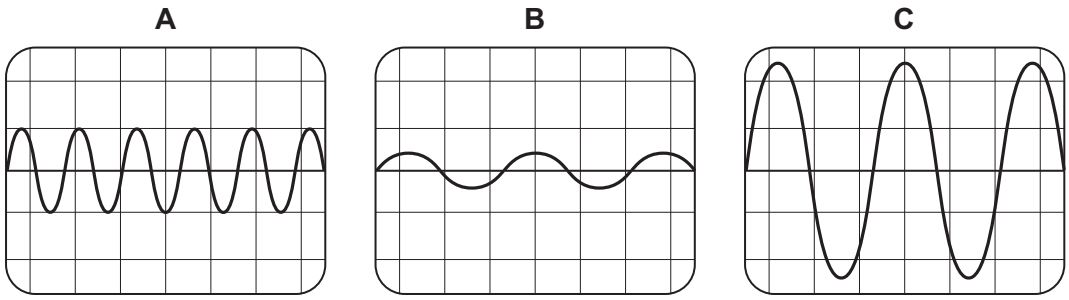


A microphone connected to a cathode ray oscilloscope (CRO) is used to detect the sound waves from the loudspeaker.

Figure 3 shows the CRO traces, **A**, **B** and **C**, produced by three different sound waves.

The settings on the CRO were the same for each trace.

Figure 3



Use the correct letter, **A**, **B** or **C**, to complete each sentence.

2 (a) (i) The sound wave with the highest frequency is shown by trace ☐.

[1 mark]

2 (a) (ii) The sound wave with the smallest amplitude is shown by trace ☐.

[1 mark]

Do not write outside the box

2 (b) The loudspeaker produces a sound wave with a frequency of 850 hertz and a wavelength of 0.4 metres.

Calculate the speed of this sound wave. Give the unit.

Use the correct equation from the Physics Equations Sheet.

Choose the unit from the list below.

joules **metres / second** **watts**

[3 marks]

.....

.....

.....

Speed = ...

2 (c) A motorbike is driven towards a microphone and CRO which are placed by the side of the road.

The motorbike emits a sound wave of constant frequency.

Draw a ring around the correct answer to complete each sentence.

[2 marks]

As the motorbike moves towards the microphone, the frequency of the sound wave detected by the microphone will be

higher than
the same as
lower than

the frequency of the sound wave produced by the motorbike.

The wavelength of the sound wave detected by the microphone will be

longer than
the same as
shorter than

the wavelength of the sound wave from the motorbike.

7

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3 Energy can be transferred through some materials by convection.

3 (a) Use the correct answer from the box to complete the sentence.

[1 mark]

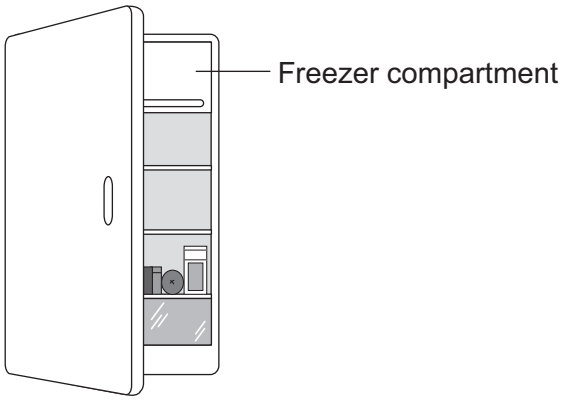
gas	**liquid**	**solid**

Energy **cannot** be transferred by convection through a ..... .

3 (b) **Figure 4** shows a fridge with a freezer compartment.

The temperature of the air inside the freezer compartment is –5 °C.

Figure 4



Use the correct answer from the box to complete each sentence.

Each answer may be used once, more than once or not at all.

[3 marks]

decreased	**unchanged**	**increased**

When the air near the freezer compartment is cooled, the energy of the air particles is ..... .

The spaces between the air particles are ..... .

The density of the air is ..... .

Do not write outside the box

3 (c) **Table 1** shows some information about three fridges, **A**, **B** and **C**.

The efficiency of each fridge is the same.

Table 1

Fridge	Volume in litres	Energy used in one year in kWh
A	232	292
B	382	409
C	622	524

3 (c) (i) Which fridge, **A**, **B** or **C**, would cost the least to use for 1 year?

[2 marks]

Give **one** reason for your answer.

.....

.....

3 (c) (ii) A householder looks at the data in **Table 1**.

What should she conclude about the pattern linking the volume of the fridge and the energy it uses in one year?

[1 mark]

.....

.....

3 (c) (iii) The householder could not be certain that her conclusion is correct for all fridges.

Suggest **one** reason why not.

[1 mark]

.....

.....

8

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4 Iceland is a country that generates most of its electricity using geothermal power stations and hydroelectric power stations.

4 (a) (i) Complete the following sentences to describe how some geothermal power stations work.

[3 marks]

In regions where volcanoes are active, the ground is hot.

Cold ..... is pumped down into the ground

and is ..... by hot rocks.

It returns to the surface as steam. The steam is used to turn a turbine.

The turbine drives a ..... to produce electricity.

4 (a) (ii) Which **one** of the following statements about geothermal power stations is true?

Tick (✓) **one** box.

[1 mark]

Geothermal power stations use fossil fuels. ☐

Geothermal power stations produce carbon dioxide. ☐

Geothermal power stations provide a reliable source of electricity. ☐

Do not write outside the box

4 (b) What is needed for a hydroelectric power station to be able to generate electricity?

Tick (✓) **one** box.

[1 mark]

Falling water ☐

A long coastline ☐

Lots of sunny days ☐

5

Turn over for the next question

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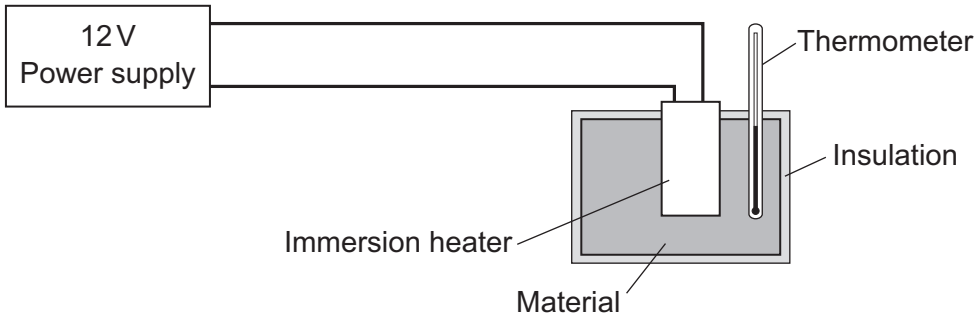
5 A student used the apparatus in **Figure 5** to compare the energy needed to heat blocks of different materials.

Each block had the same mass.

Each block had holes for the thermometer and the immersion heater.

Each block had a starting temperature of 20 °C.

Figure 5



The student measured the time taken to increase the temperature of each material by 5 °C.

5 (a) (i) State **two** variables the student controlled.

[2 marks]

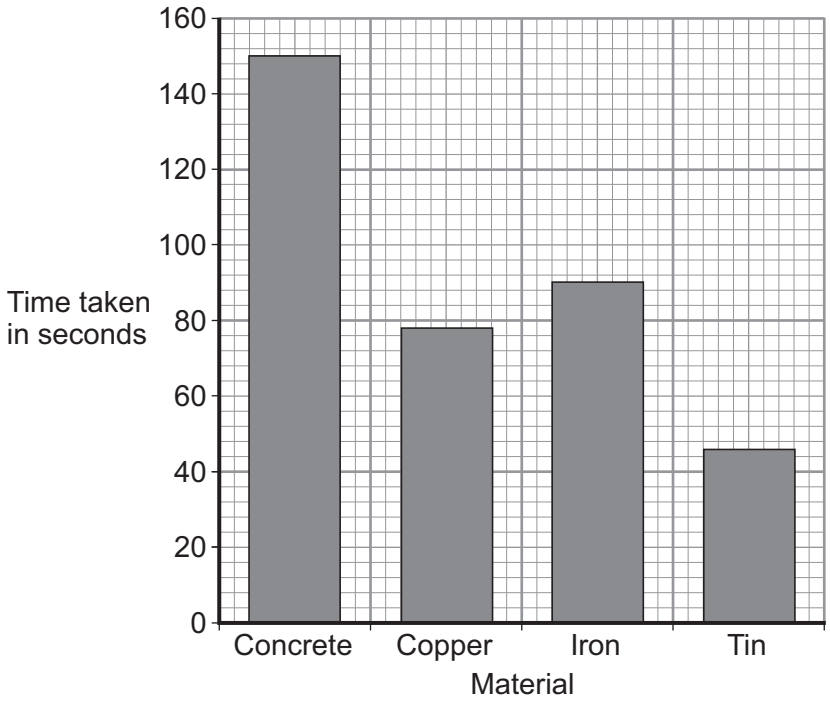
1 .....

2 .....

Do not write outside the box

Figure 6 shows the student's results.

Figure 6



5 (a) (ii) Why was a bar chart drawn rather than a line graph?

[1 mark]

.....

.....

5 (a) (iii) Which material was supplied with the most energy?

.....

Give the reason for your answer.

[2 marks]

.....

.....

Question 5 continues on the next page

Do not write outside the box

5 (a) (iv) The iron block had a mass of 2 kg.

Calculate the energy transferred by the heater to increase the temperature of the iron block by 5 °C.

Use the correct equation from the Physics Equations Sheet.

The specific heat capacity of iron is 450 J/kg °C.

[2 marks]

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Energy transferred = ... J

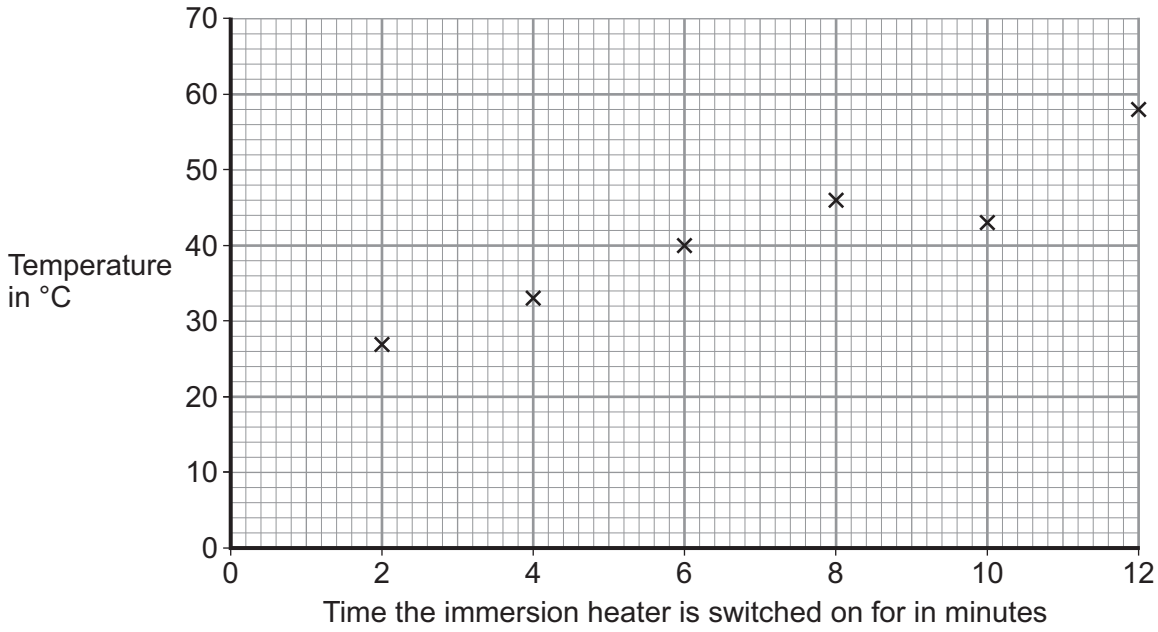
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5 (b) The student used the same apparatus to heat a 1 kg block of aluminium.

He recorded the temperature of the block as it was heated from room temperature.

The results are shown in **Figure 7.**

Figure 7



5 (b) (i) One of the student's results is anomalous.

Draw a ring around the anomalous result.

[1 mark]

5 (b) (ii) Draw the line of best fit for the points plotted in **Figure 7**.

[1 mark]

5 (b) (iii) What was the temperature of the room?

[1 mark]

Temperature = ... °C

5 (b) (iv) What was the interval of the time values used by the student?

[1 mark]

Interval = ... minutes

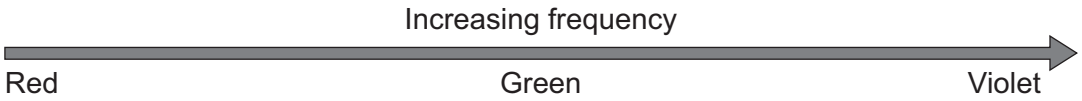
11

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6 (a) The visible light spectrum has a range of frequencies.

Figure 8 shows that the frequency increases from red light to violet light.

Figure 8



Use the correct answers from the box to complete the sentence.

decreases	**stays the same**	**increases**

[2 marks]

As the frequency of the light waves increases, the wavelength

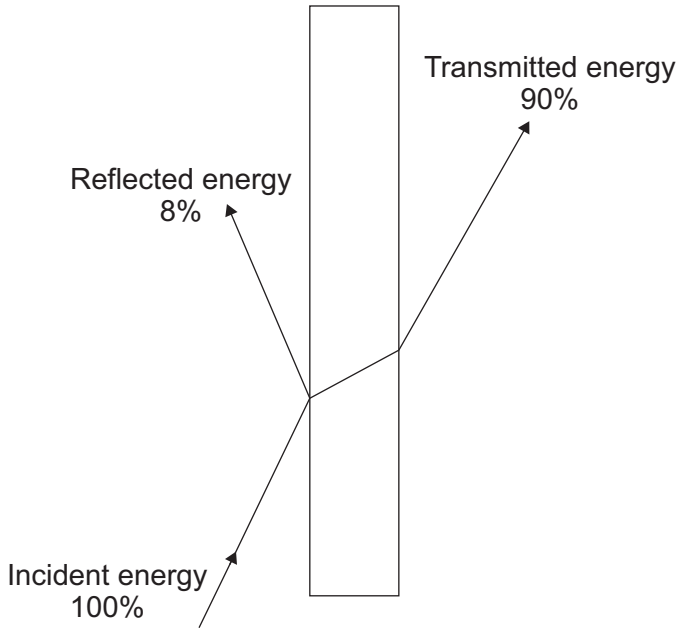
of the light waves ..... and

the energy of the light waves ..... .

Do not write outside the box

6 (b) **Figure 9** shows what happens to the light energy when a ray of light hits a glass block.

Figure 9



98% of the incident energy is either reflected or transmitted by the glass block.

What happens to the other 2% of the incident energy?

[1 mark]

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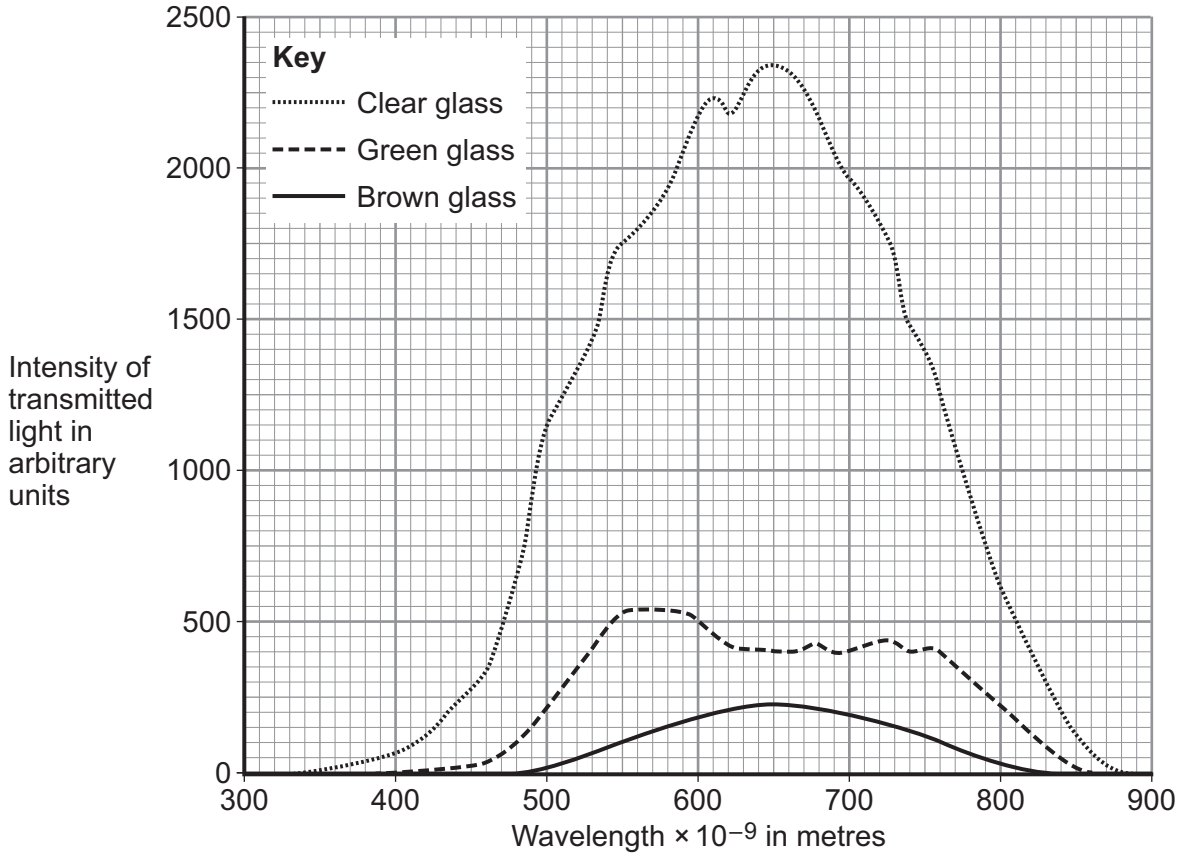
Question 6 continues on the next page

Do not write outside the box

6 (c) Bottled beer will spoil if the intensity of the light passing through the glass bottle into the beer is too high.

Figure 10 shows the intensity of the light that is transmitted through three different pieces of glass.

Figure 10



6 (c) (i) The pieces of glass all had the same thickness.

Suggest why.

[1 mark]

.....

.....

6 (c) (ii) Bottles made of brown glass are suitable for storing beer.

Suggest why.

[1 mark]

.....

.....

5

Do not write outside the box

7 Electricity can be generated using various energy sources.

7 (a) Give **one** advantage and **one** disadvantage of using nuclear power stations rather than gas-fired power stations to generate electricity.

[2 marks]

Advantage .....

.....

Disadvantage .....

.....

7 (b) (i) A single wind turbine has a maximum power output of 2 000 000 W.

The wind turbine operated continuously at maximum power for 6 hours.

Calculate the energy output in kilowatt-hours of the wind turbine.

Use the correct equation from the Physics Equations Sheet.

[2 marks]

.....

.....

.....

Energy output = ... kWh

7 (b) (ii) Why, on average, do wind turbines operate at maximum power output for only 30% of the time?

[1 mark]

.....

.....

7 (c) An on-shore wind farm is made up of many individual wind turbines.

They are connected to the National Grid using underground power cables.

Give **one** advantage of using underground power cables rather than overhead power cables.

[1 mark]

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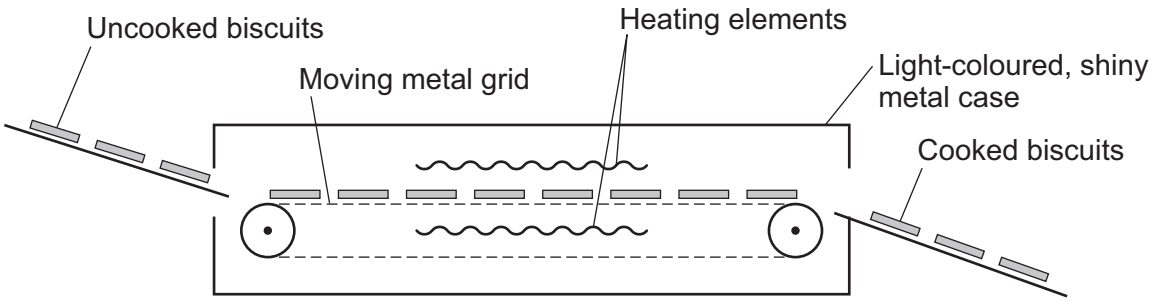
8 **Figure 11** shows one way that biscuit manufacturers cook large quantities of biscuits.

The uncooked biscuits are placed on a moving metal grid.

The biscuits pass between two hot electrical heating elements inside an oven.

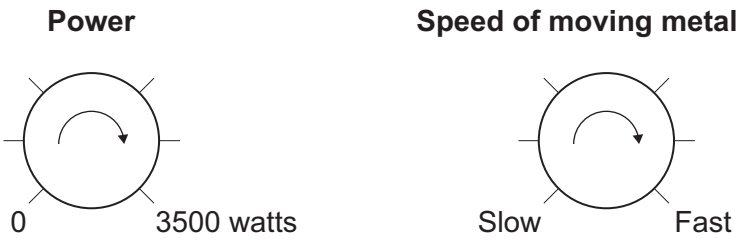
The biscuits turn brown as they cook.

Figure 11



The oven has two control knobs, as shown in **Figure 12**.

Figure 12



8 (a) Which type of electromagnetic radiation makes the biscuits turn brown?

[1 mark]

.....

8 (b) Suggest **two** ways of cooking the biscuits in this oven, to make them turn browner.

[2 marks]

1 .....

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2 .....

.....

Do not write outside the box

8 (c) The inside and outside surfaces of the oven are light-coloured and shiny.

Explain why.

[3 marks]

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6

Turn over for the next question

Do not write outside the box

9 **In this question you will be assessed on using good English, organising information clearly and using specialist terms where appropriate.**

The information in the box is about the properties of solids and gases.

Solids:
- have a fixed shape
- are difficult to compress (to squash).

Gases:
- will spread and fill the entire container
- are easy to compress (to squash).

Use your knowledge of kinetic theory to explain the information given in the box.

You should consider:
- the spacing between the particles
- the movement of individual particles
- the forces between the particles.

[6 marks]

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END OF QUESTIONS

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